CHAPTER IV

OPERATIONAL ATTRIBUTES

The operational attributes are those that respond to the question of how, a produce is obtained and, what means and practices are employed to obtain agricultural production. It emphasizes what are labour and capital inputs and what is the intensity of their use as well as the landuse in different orientations.

In the agricultural based developing countries like India, the customs, traditions, attitudes and cultural values of people determine the operational practices of land cultivation. The occupational and professional choices depend upon the human behaviour and social transformation. The level of efficiency in the use of land and the quality and quantity of return from it very much depend upon the social system,
the organisational set up, the level of technology and types of rural settlements. Accordingly, the aspects of land, labour and capital are significant criteria and their in-depth study is imperative to understand their functional relationship with agricultural typology. "The rising interest in the role of man as creator and changes of the agricultural landscape are also reflected in the greater attention, being given to the importance of human motivation in his transformation. Economic, cultural and political influences are, of course, inseparable in their operations, but, this has not deferred geographers and other specialists from attempting to isolate these influences and to weigh their relative importance" (Geogore, 1970).

The IGU Commission on Agricultural Typology has listed seven operational attributes which combinely and correlatively emphasize the predominant organisational and technical practices that operate the land holdings to achieve agricultural production. They are (i) inputs of human labour power, (ii) inputs of animal power, (iii) inputs of mechanical power, (iv) quantity of chemical fertilizing, (v) intensity of irrigation, (vi) intensity of cropland use and, (vii) intensity of livestock breeding. Each attribute reflects its identity in the overall organisation of agricultural typology, and its individual role is studied separately.

Attribute-8 Inputs of Labour in terms of the Number of People Engaged in Agriculture per 100 Hectares of Agricultural Land:

This variable refers to the input of labour in terms of number of people actively engaged in agriculture per 100 hectares of agricultural land. There are two factors which determine the input of labour power, (i) the number of cropping systems in an agricultural year, and (ii) the type of crop grown and the spatial spread. The maximum demand for labour is essentially found during the main monsoonal period.
second cropping season, the demand for labour is normally low because of limited spatial extent of cultivation due to limited water supply. Further high input of labour will generally be required to the cultivation of intensive irrigated crops like paddy, mulberry, sugarcane, garden crops and etc.

In Chittoor district the total number of people actively employed in agriculture are numbered to 10,39,081, thus registering on an average of 149 persons per 100 hectares of agricultural land. There has been a significant spatial variation in the employment of human labour per 100 hectares of agricultural land with in the district. Tirupati division has the highest number of labour input accounted to 209 persons per 100 hectares of agricultural land and it followed by Chittoor (188 persons per 100 ha.) and Madanapalle (117 persons per 100 ha.) divisions. The highest input of human labour in Tirupati division is due to high intensity of agricultural landuse and predominant cultivation of paddy. The low input of human labour in Madanapalle division is due to extensive cultivation of dry crop especially groundnut and they have been confined to short crop growing period.

At mandal level, the input of human labour varies from a maximum of 299 persons per 100 hectares in Nagari mandal to a minimum of 83 persons per 100 hectares of agricultural and in B.Kothakota Mandal. The high (200-250 persons per 100 ha.) and very high (250 persons per 100 ha.) inputs of human labour are found in 12 mandals which are mostly distributed in the eastern parts of the district. Here, the high intensity of irrigation and cropland use, large number of small holdings and agricultural settlements and predominant cultivation of paddy and irrigated groundnut are cumulatively warranted for high input of human labour per unit of agricultural land.
Moderate input of labour (250-200 persons per 100 ha. of agricultural land) is found in 40.9 per cent of the total mandals of the district. These are located largely in eastern, southern, south-western and central parts of the district where the cropping intensity is also moderate. Low (100-150 persons per 100 ha.) and very low (100 ha.) inputs of human labour are found in 27 mandals which accounted for 40.9 per cent of the total mandals of the district. They are located in western, north-western and mid-northern parts of the district. Here, the large size of land holdings in terms of area, comparatively less number of agricultural holdings, low density of agricultural settlements, predominant cultivation of dry crops confining to single cropping and short cropping period, low development of irrigation and low intensity of cropland use are cumulatively held for low input of human labour per unit of agricultural land. This has revealed the significant spatial variation in the application of human labour input and thereby reflecting the micro influences of labour input in the organisational aspect of agriculture in contrast to other variables.

Attribute-9 Input of Animal Power in terms of the Number of Conventional Draught Units Per 100 Hectares of Cultivated Land:

This variable covers the input of animal power in terms of conventional units per 100 hectares of cultivated land i.e. land under temporary and perennial crops. Adequate power to perform the agricultural operations is very much essential in the absence of large scale mechanization and small nature of holdings, animal power is the main source. It can be mentioned that in the Indian rural agrarian system, farmers and animals have stood together and shared equal labour in the field. For better comparison of the application of animal power in the field operations, the number of draught animals are converted into conventional draught animal power as proposed by IGU Commission on Agricultural Typology.
FIG. 4-2

CHITOOR DISTRICT
INPUT OF ANIMAL POWER
(1931–32)

INDEX

\[\begin{array}{lll}
20 & \checkmark & 20-30 \\
30-40 & \checkmark & 40-50 \\
50 & \checkmark & \\
\end{array}\]

No. of draught units per 100 hect of cultivated land (in conventional units).

0 Km 25

N
In Chittoor district the total number of conventional draught animal power units are accounted to 1,46,233 covering the cultivated area of 5,09,886 hectares thus registering the average animal power of 29 c.u per 100 hectares. Tirupati division has the highest (42 c.u. per 100 ha.) utilisation of animal power and it is followed by chittoor (29 c.u. per 100 ha.) and Madanapalle (25 c.u. per 100 ha.) divisions. The highest consumption of animal power in Tirupati division is due to small nature of holding and intensive cultivation of the land and high degree of agricultural operation than the other parts of the district.

The spatial distribution of input of animal power at mandal level varies from a maximum of 82 c.u. per 100 hectares in Tirupati urban mandal to a minimum of 12 c.u. per 100 ha. in Thavanampalle mandal. The high (40-50 c.u. per 100 ha.) and very high (50 c.u. per 100 ha.) inputs of animal power are found in 17 mandals distributed in the eastern region of the district. Large number of small size of land holdings, small field size, high intensity of agricultural landuse, multiple cropping systems and year round agricultural operations have lead to the application of more animal power in eastern parts of the district. Moderate (30-40 c.u. per 100 ha.) input of animal power is found in 19 mandals distributed largely in eastern and south-western parts of the district.

Low (20-30 c.u. per 100 ha.) and very low(20c.u. per 100 ha.) inputs of animal power consumption are found in 30 mandals which accounted for 45.5 per cent of the total mandals of the district. They are distributed in western, north-western and central parts of the district. Here, low concentration of agricultural holdings, extensive
cultivation of dry crops, low intensity of cropland use, and seasonal agricultural operations have not been demanded for high consumption of animal power.

It is better evidence to indicate the fact that the agricultural operation trend in the district is characterized by significant animal labour combination on account of abundant availability of draught animals throughout the district.

Attribute-10 Inputs of Mechanical Power in terms of the Number of Horse Power of Tractors and other Self Profelling Machinery Per 100 Hectares of Cultivated Land:

This variable refers to the input of mechanical power in terms of number of tractors, including harvesters and other self profelling machinery in horse power per 100 hectares of cultivated land. In the process of modernization of agriculture, the input of mechanical power in the field of agricultural operations is very much significant. Some degree of 'technification' (Jasbir Singh 1974) will be essentially required if the existing level of agricultural production per unit area and per capital has to be increased. In modern usage 'technification' covers two aspects of farm technology viz., biological and mechanical, the twin influence the progress in farm production and they are primary base of the 'Green Revolution' (Jasbir Singh, 1974).

In Chittoor district the total input of mechanical power (in conventional units) is calculated to 1,04,590 H.P. covering an area of 5,09,886 hectares of cultivated land and thus recording an average of 21 H.P. per 100 hectares of cultivated land.

It is quite interesting to note that there has been a significant spatial variation in the input of mechanical power, in the district. It is evident from the fact that Chittoor
division has the highest input of mechanical power of 44 H.P. per 100 hectares of cultivated land and it followed by Tirupati (27 H.P. per 100 ha.) and Madanapalle (9 H.P. per 100 ha.) divisions.

The input of mechanical power at mandal level varies from a maximum of 168 H.P. in Thavanampalle mandal to a minimum of 2 H.P. in Gurramkonda mandal. The high (30-40 H.P. per 100 ha.) and very high (40 H.P. per 100 ha.) inputs of mechanical power are found in 13 mandals distributed in south-central region and in some parts of eastern region of the district. Here, the high development of well irrigation, intensive cultivation of sugarcane and paddy, less availability of draught animal power and prosperous socio-economic conditions contributed to the high degree of mechanical power consumption in the development of agriculture. Moderate (20-30 H.P. per 100 ha.) input of mechanical power is noticed in 17 mandals distributed in central and eastern regions of the district.

Low (10-20 H.P. per 100 ha.) and very low (H.P. per 100 ha.) inputs of mechanical power consumption are found in 36 mandals which accounted for 54.5 per cent of the total mandals of the district. They are distributed in the western region of the district. Here, the frequent failure of monsoons, low development of irrigation, extensive dry farming and poor socio-economic conditions are caused to low input of mechanical power in the field operations.

Attribute - 11 Chemical Fertilizing in Terms of the Amount of Chemical Fertilizers in Pure Content (NPK) in Kilograms per Hectare of Cultivated Land:
This variable deals with the application of the amount of chemical fertilizers in pure content (NPK) per one hectare of cultivated land.

The application of chemical fertilizer is the most important input in boosting up the agricultural production. It is obvious that without fertilizers farmers cannot get more benefits from their lands. However, the intensity of chemical fertilizers use depends upon the nature of the soil and soil fertility, cropping pattern, irrigation facilities, socio-economic conditions of the farming community and temperamental predilections of the farmers towards the use of fertilizers.

Both biological manures and chemical fertilizers are more or less equally important for modern agriculture. To enhance the per hectare yield levels, to practice the superior cropping systems, to raise the multiple cropping systems and intensification of agriculture, the soils and their fertility states are to be improved by the application of sufficient and required dosage of fertilizer input.

In Chittoor district the total consumption of chemical fertilizers is amounted to 7,71,00,820 Kgs. covering an area of 5,09,886 hectares of cultivated land. On an average it is calculated to 151 kgs. per hectare of cultivated land. There has been a significant variation in the consumption of fertilizers within the district. The highest consumption of fertilizers is noticed in Tirupati division (228 kgs. per ha.) and it followed by Chittoor (167 Kgs. per ha.) and Madanapalle (120 kgs. per ha.) divisions.

The use of chemical fertilizers varies from a maximum of 458 kgs. per hectare in Kammapalle mandal to a minimum of 31 kgs. per hectare in Pichatur mandal.
INPUT OF CHEMICAL FERTILISERS
CHITTOOR DISTRICT
(1991-92)

FIG. 4.4

Chemical fertilisers per hectare of cultivated land (in Kgs.)

INDEX

\begin{itemize}
\item 50
\item 50 - 100
\item 100 - 150
\item 150 - 200
\item 200
\end{itemize}

\textbf{FIG. 4.4}
high (150-200 kgs. per ha.) and very high (200 kgs. per ha.) consumption of chemical fertilizer is found in 26 mandals distributed mostly in the eastern region and in some parts of central region of the district. In these areas, favorable rainfall conditions, significant development of irrigation, intensive cultivation of crops, like paddy, sugarcane and irrigated groundnut as well as the poor quality of soils favored the high consumption of chemical fertilizers. Moderate (100-150 kgs. per ha.) consumption of chemical fertilizers is noticed in 17 mandals distributed mostly in central and eastern regions of the district.

Low (50-100 kgs. per ha.) input of chemical fertilizers is found in 17 mandals located in western region of the district. Very low (2 kgs. per ha.) consumption of chemical fertilizers is found in 6 mandals namely Tirupati Urban, Bangarupalem, V. Kota, Ramasamudram and Madanapalle mandals. The low development of irrigation, frequent occurrences of drought, and prolonged dry spells, extensive cultivation of dry crops have had a shattering effect on the consumption of chemical fertilizers in the western region of the district.

Attribute - 12 Irrigation Measured by the Percentage of Irrigated Land in the total Cultivated Land:

This variable refers to the percentage of irrigated land (all forms and systems of irrigation) in the total cultivated land. It is obvious that irrigation is the most determining factor of agricultural production through different means of hybridization, intensification, mechanization, fertilizer consumption, plant protection and what we specially called, modernization of agriculture.
In Chittoor district, by all sources of irrigation the irrigated area accounted for 41 per cent of the total cultivated area. Among the three revenue divisions, Tirupati division has high proportion of irrigated area (74%) to the cultivated area and it is followed by Chittoor (43%) and Madanapalle (20%) divisions. Among the different sources of irrigation in the district, well irrigation is important which accounted for 58.9 per cent of the total irrigated area of the district and it is followed by tank irrigation (37.9%, canal irrigation (2.4%) and other sources (0.8%). Therefore, well irrigation and tank irrigation are significant for the development of agriculture in the district.

At mandal level, the high percentage of irrigation (95%) is found in Srikalahasti mandal while the lowest (9%) in Pedda Tippa Samudram, mandal. The high (60-80%) and very high (>80%) percentages of irrigated land are found in 19 mandals distributed completely in the eastern region of the district. In this region, the high rainfall conditions especially through depression and cyclones, high ground water potential and a limited extent of canal irrigation through medium irrigation projects are favored for high intensity of irrigation.

Moderate intensity of irrigated land (40-60%) is found in 5 mandals only (Karivetinagar, Vedurukuppam, Kammapalle, Vadavalpet and Palasamudram) located in the eastern region of the district. Low (20-40%) and very low (<20 %) intensities of irrigated land are found in 42 mandals which accounted for 63.7 per cent of the total mandals of the district. These mandals are located in western and central regions of the district. Particularly, the north- western region is found with very low intensity of irrigation. The low and precarious rainfall conditions, frequent occurrences of
low ground water potential and absence of canal irrigation facilities are causes for low intensity of irrigation in the western region of the district.

**Attribute-13 Intensity of Cropland use in terms of the Percentage of Harvested Land Under Temporary Crops in the Total Land Under Temporary Crops Including Fallow:**

This variable refers to the intensity of cropland use, in terms of the percentage of harvested land under temporary crops in the total arable land (including fallow).

The physical, socio-economic and technological conditions certainly bear a profound influence on the intensity of cropland use of any region. The solution for the problem lies in the expansion of cultivation, reduction of the fallow lands and by increasing the area sown more than once.

In Chittoor district, the average harvested land is accounted for 74 per cent in the total arable land. The high intensity of harvested land (79%) is recorded in Tirupati division, while the low intensity in Madanapalle (72%) division. In Chittoor division it is accounted for 76 per cent. The low intensity of cropland use in Madanapalle division is due to extensive rainfed farming and low development of irrigation.

At mandal level, the highest percentage of cropland use (100%) is registered in Ramasamudram mandal while the lowest in Tirupati Urban mandal (29%).

The high (80-90%) and very high (90%) intensities of cropland use are found in 28 mandals distributed largely in eastern, southern, south-central and north-western parts of the district. The high rainfall conditions, high development of irrigation and
high density of agricultural settlements in eastern region are favorable for the cultivation and colonization of all agricultural lands. Low (60-70%) and very low (<50%) intensities of cropland use are found in 24 mandals distributed in western, central and north-central parts of the district. In these areas, the low rainfall conditions, frequent occurrence of droughts, low development of irrigation and lack of dry farming technology and poor socio-economic conditions are the unfavorable conditions for bringing up all the cultivable lands under cropping. Here the spatial spread of fallow lands are significant.

Attribute - 14 Intensity of Livestock Breeding for Production Purposes in terms of the Number of Farm Animals in Conventional (Large) Animal Units per 100 Hectares of Agricultural Land:

This variable deals with the intensity of livestock breeding in terms of number of conventional (large) animal units per 100 hectares of agricultural land.

Referring to livestock breeding, Jasbir Sing (1974) has rightly stated that they are the constant companions of the farmer in the field by day and live besides his house or even under the same roof at night. The intensity of livestock breeding in a region emphasizes the way of peasant life and the orientation of farming. Though the livestock breeding is neglected is a neglected branch of agriculture in general, in the country, it forms significant part of rural agricultural economy in Chittoor district.

In Chittoor district the total livestock breeding accounted to 9,94,606 conventional animal units. On an average, it has registered 143 conventional animal units per hectare of agricultural land. There has been a significant spatial variation in the distribution of livestock breeding in the district. It is found that the high intensity
of livestock breeding (211 conventional animal units per 100 ha.) is recorded in Tirupati division and the low (115 conventional animal units per 100 ha.) in Madanapalle division. The intensity of livestock breeding in Chittoor division accounted for 166 conventional animal units per 100 hectares of agricultural land.

At mandal level, the intensity of livestock breeding varies from a maximum of 651 conventional animal units per 100 hectares in Tirupati Urban mandal to a minimum of 57 conventional animal units in Thavanamapalle mandal. The high (200-250 animal units per 100 ha.) and very high (250 animal units per 100 ha.) intensities of livestock breeding are found in 13 mandals located in the eastern region of the district. Here, the large number of small size and small scale of land holdings, high consumption of animal power in agricultural operations and small scale commercial dairying as a way of subsidiary occupation of small and marginal peasants are held responsible for high intensity of livestock breeding.

Moderate intensity of livestock (150-200 animal units per 100 ha.) breeding is found in 26 mandals which accounted for 39.4 per cent of the total mandals of the district. These mandals are largely located in eastern and central parts of the district. Intensive small scale commercial dairying and poultry are significant livestock breeding activities found in the central region of the district. Low (100-150 conventional animal units per 100 ha.) and very low (d animal units per 100 ha.) concentrations of livestock breeding are found in 27 mandals. These low concentrations are observed in western and northern parts of the district. Here, the large size of land holdings, high proportion of agricultural land low consumption of animal power in agriculture and less attitude
of farmers towards commercial livestock breeding are held responsible for very low intensity of livestock breeding.

From the above analysis, it is found that there has been a significant spatial variation in the distribution of operational attributes of agriculture in Chittoor district. The eastern parts of the district are predominant in the inputs of human labour, animal power, fertilizer consumption, intensity of irrigation, cropland use and livestock breeding. Many parts of eastern plain region are conspicuously distinguished from the other areas of the district in the distribution of high inputs of operational attributes due to favorable physical and socio-economic conditions. The transitional zone between the plains and uplands i.e. central region is significant in the input of mechanical power consumption and moderate in the consumption of labour, chemical fertilizer, intensity of cropland use and livestock breeding. Most of the western region consisting of uplands is poorly endowed with all operational attributes due to environmental constraints, low technology and poor socio-economic conditions of the farmers.